Research Exchange - A Collaborative Paper Annotation Tool

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http://researchexchange.cs.umass.edu:3000

Our Motivation...

- Senior student in Electrical and Computer Engineering
- Needs to start on her senior project
- Has no research experience
- Having a hard time reading research papers

Initial Exploration

- Team discussion
- Interviews (8 unstructured, 4 structured)
  (Computer Science, Linguistics, Industrial Engg, ECE @ UMass)
- Recording and Transcripts (for structured)
- Screen recording of graduate students (3x)

Frustrations with Paper Reading

- Technical jargons
- Scattered information over the internet
- Paper exploration difficulties
- Inconsistent paper formatting

Objectives

- To develop a collaborative research paper reader that can aid researchers to understand the paper better
- To enable aggregation of annotations which would help researchers gain perspective

Research Exchange!

Experiments

- Research group giving feedback on unpublished draft (Naturalistic Setting)
  - Research group based evaluation (n=7)
- Survey based evaluation (Controlled Setting)
  - Individual evaluation of the features of the tool (n=7+3)

Population

Experience	Description	Count
Experienced researcher	Completed Ph.D. and >4 years of experience	1
Research student	Ph.D. students with 2 to 4 years of experience	3
Beginner research	Undergraduate students with 0-2 years of experience	5

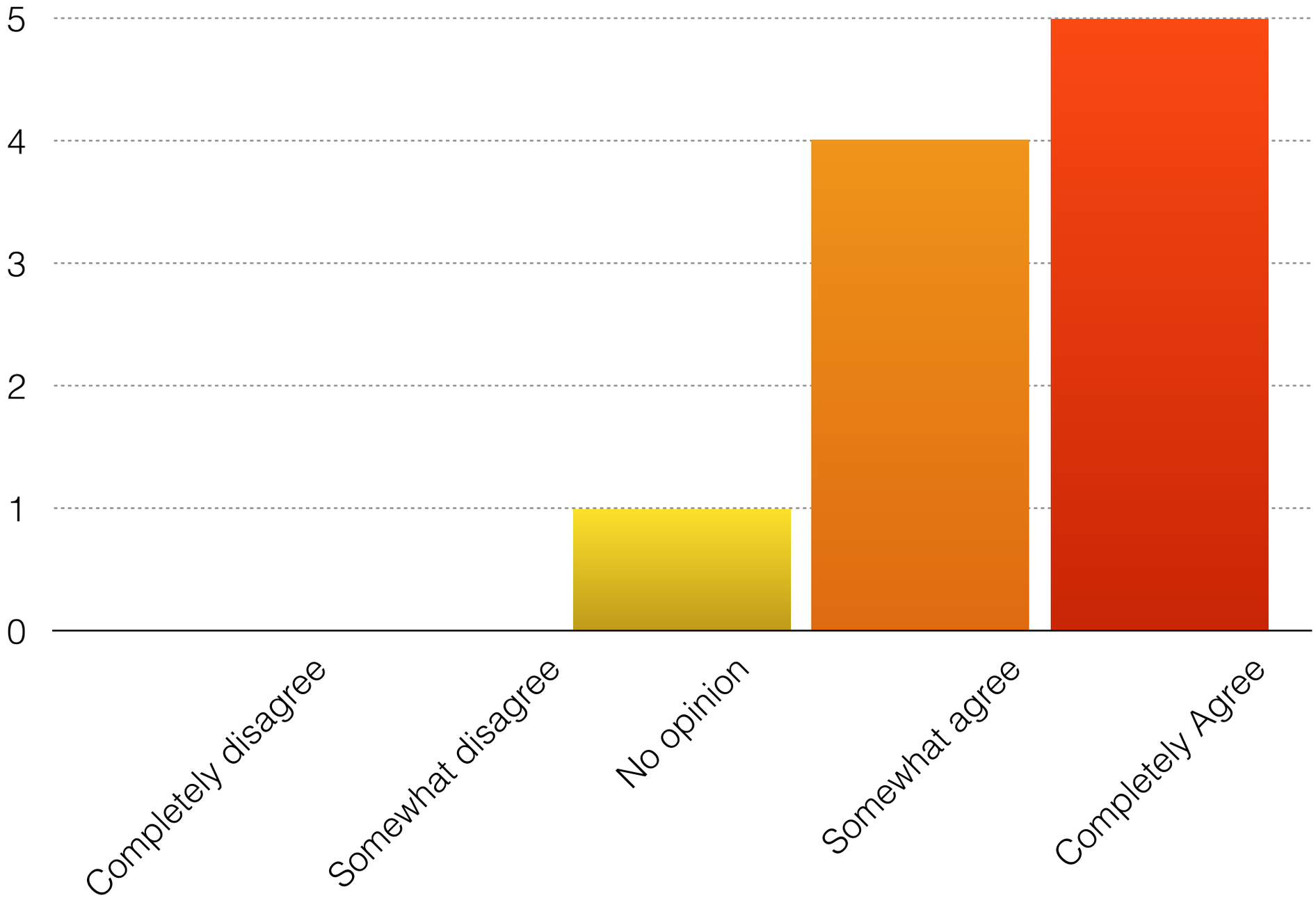
Emergent Themes

Likes	Dislikes
Appreciate the different color coding of the different annotations	Need help and guidance for a novice user
Space for asking questions within a section	Separation between the paragraphs
Organization-Traversal between the applications	Features like search; export of comments; private annotations

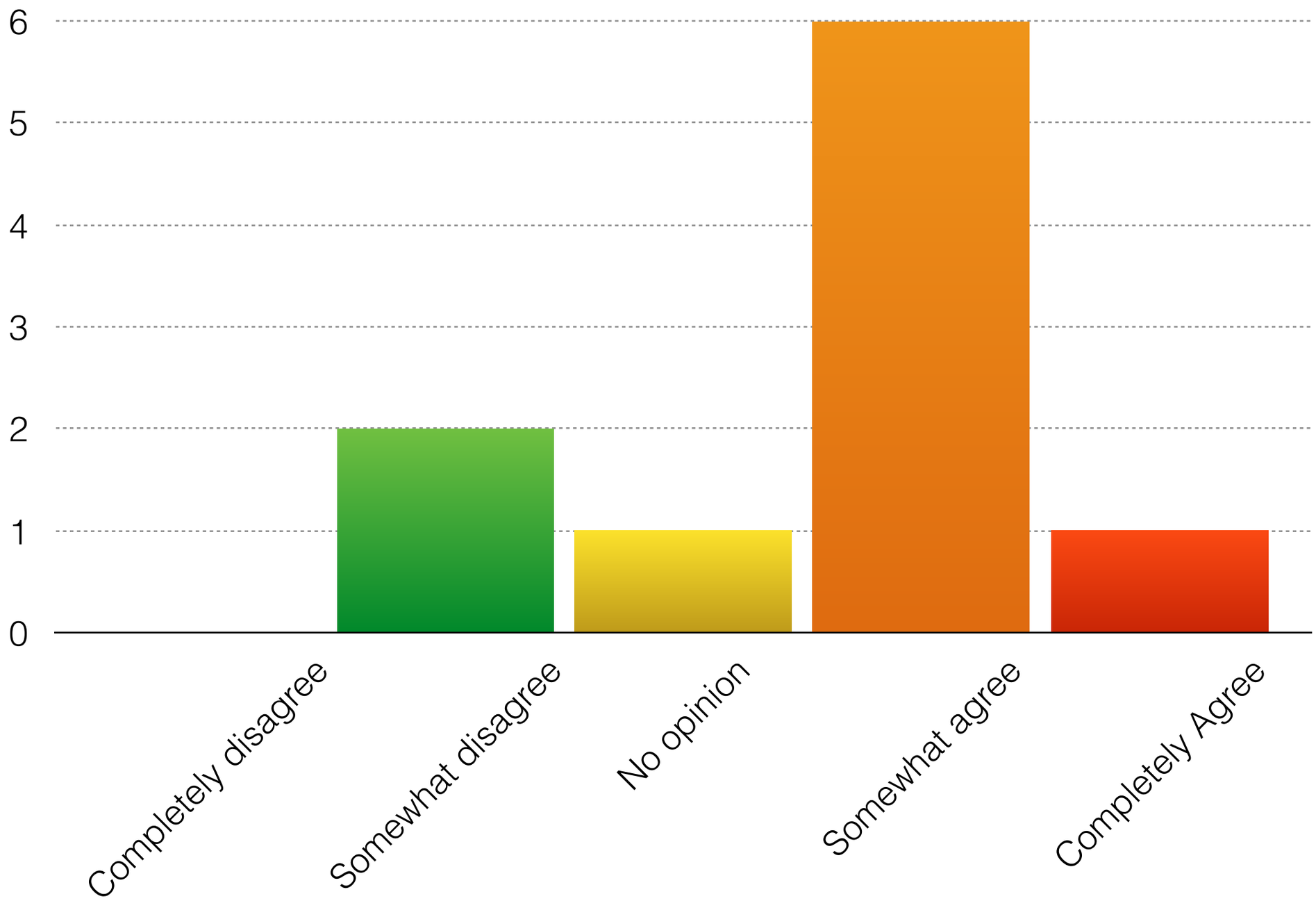
Hypothesis One

Annotations lead to better understanding of the paper

Are the shared annotations useful?



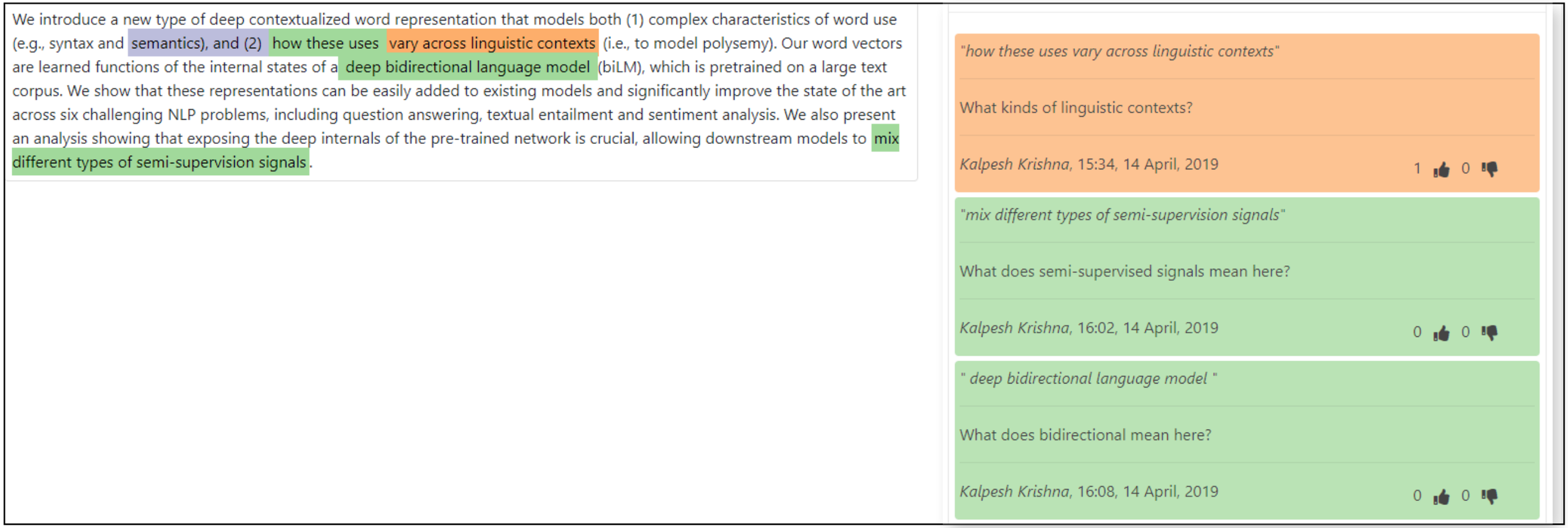
Are the shared annotations useful?



Result One: Annotated papers help with understanding

- Results: t = -2.3772, df = 16.493, p-value = 0.02985

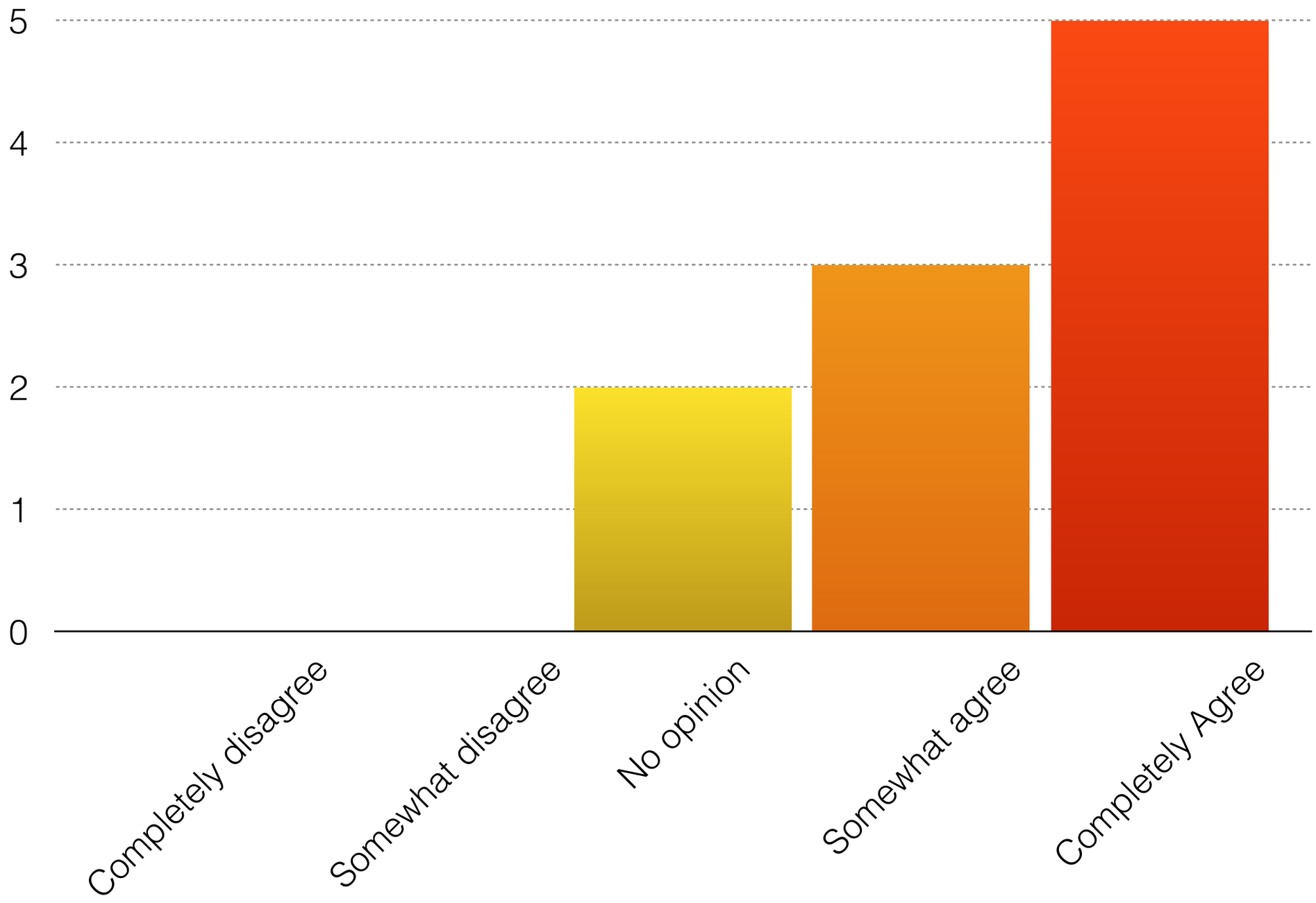
Useful Inline Comments



Hypothesis Two

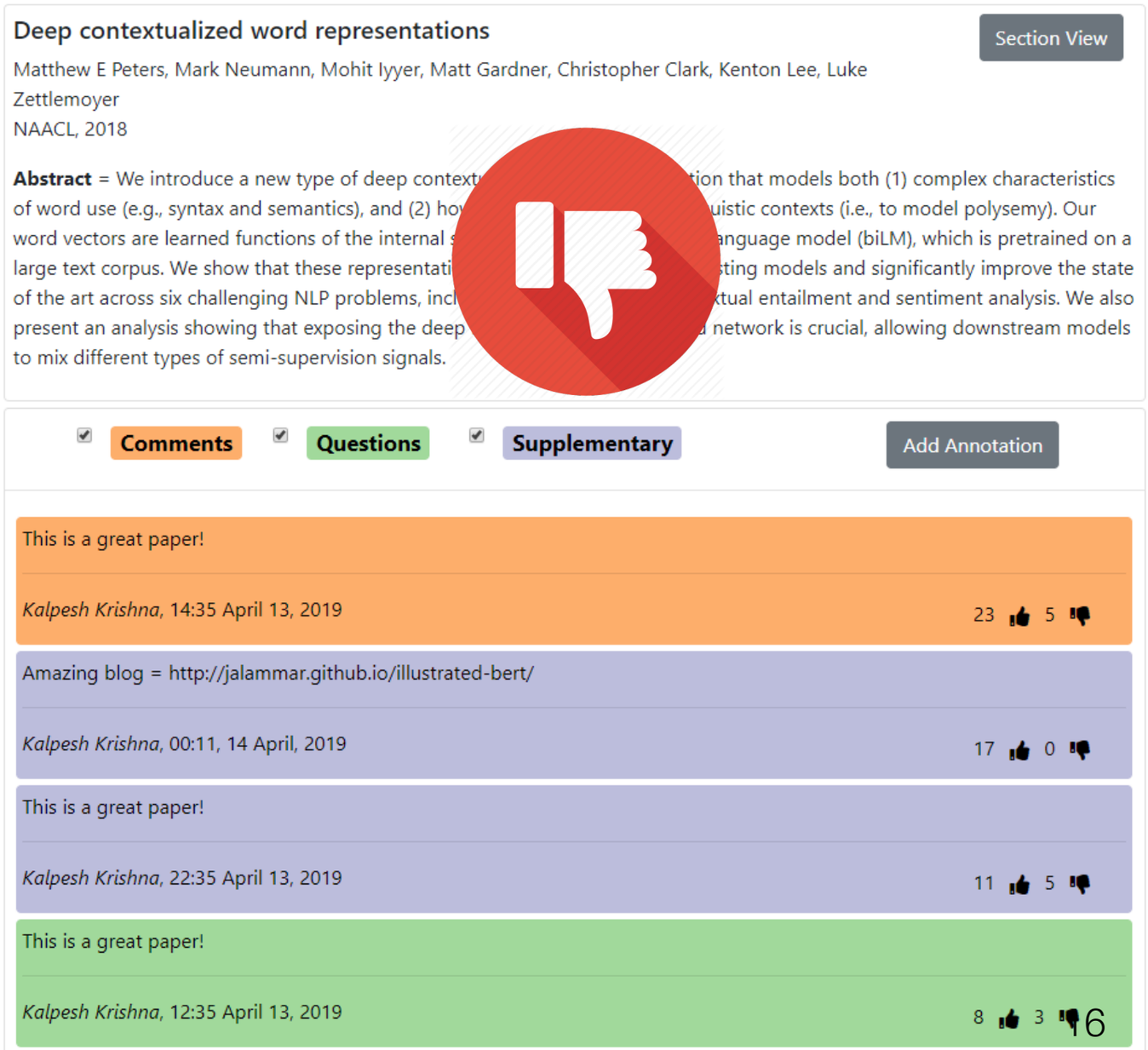
Researchers find section level annotations better than document level annotations

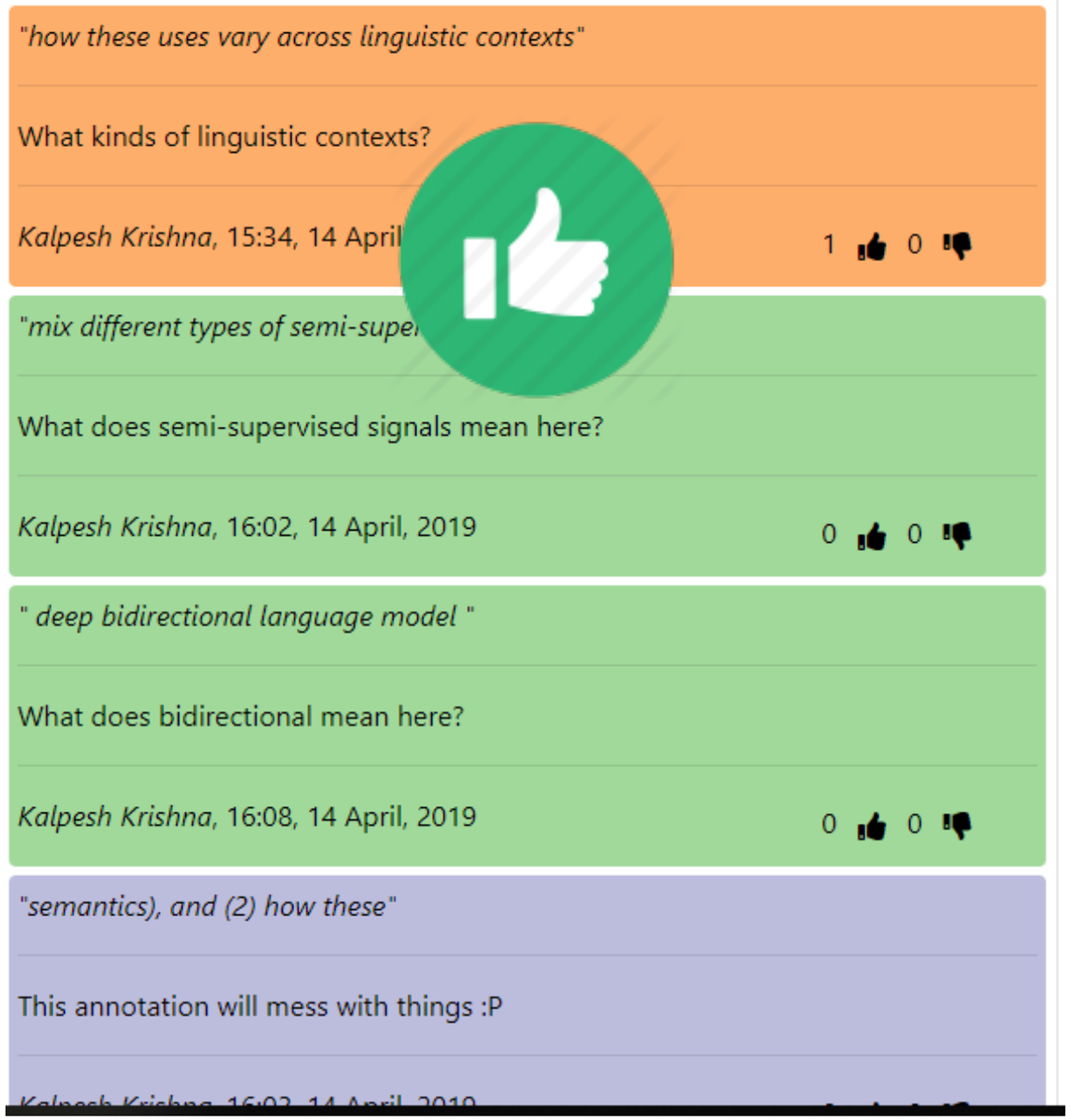
Is section level more useful than document level?



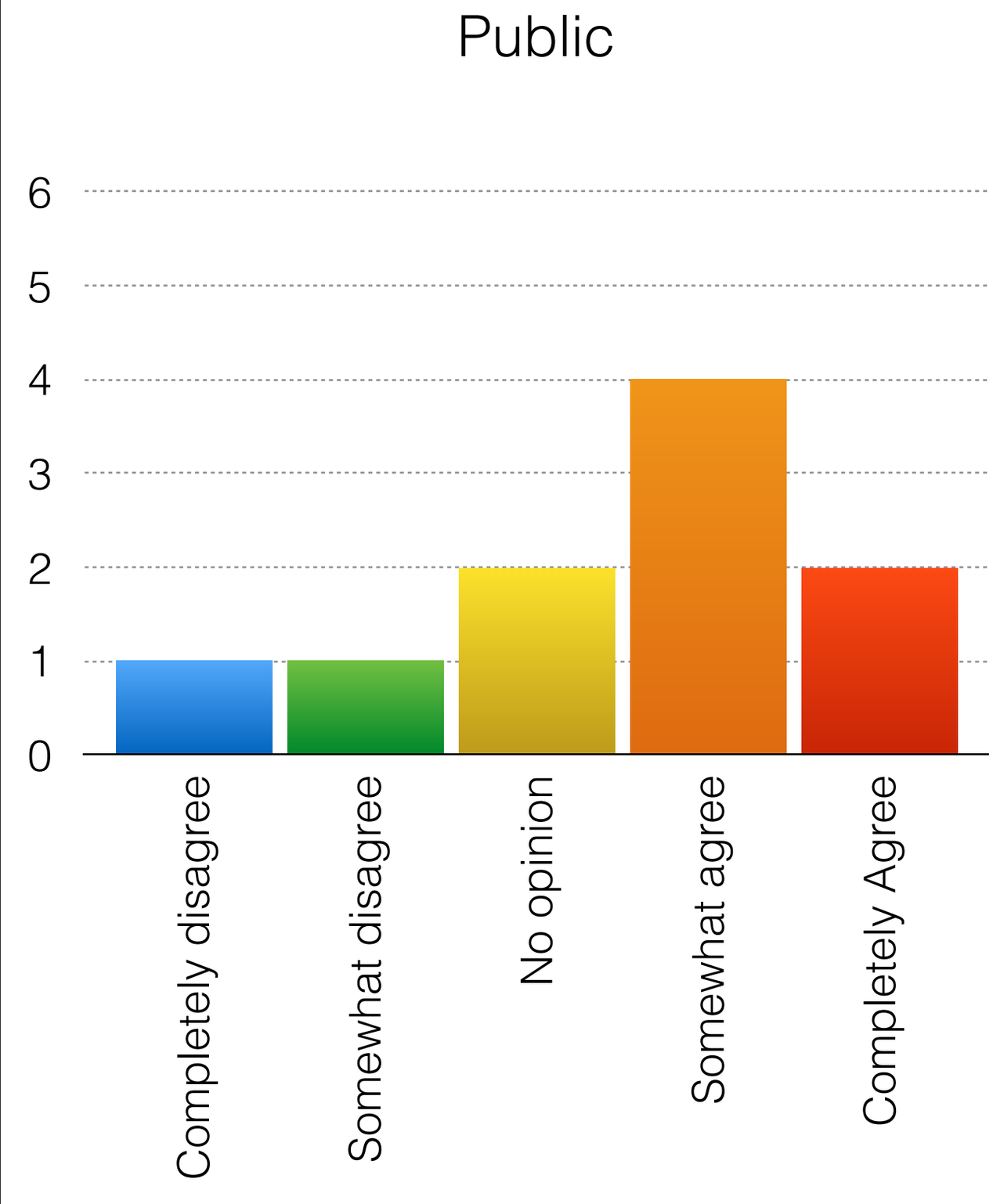
Results Two: Researchers find section view better than document view

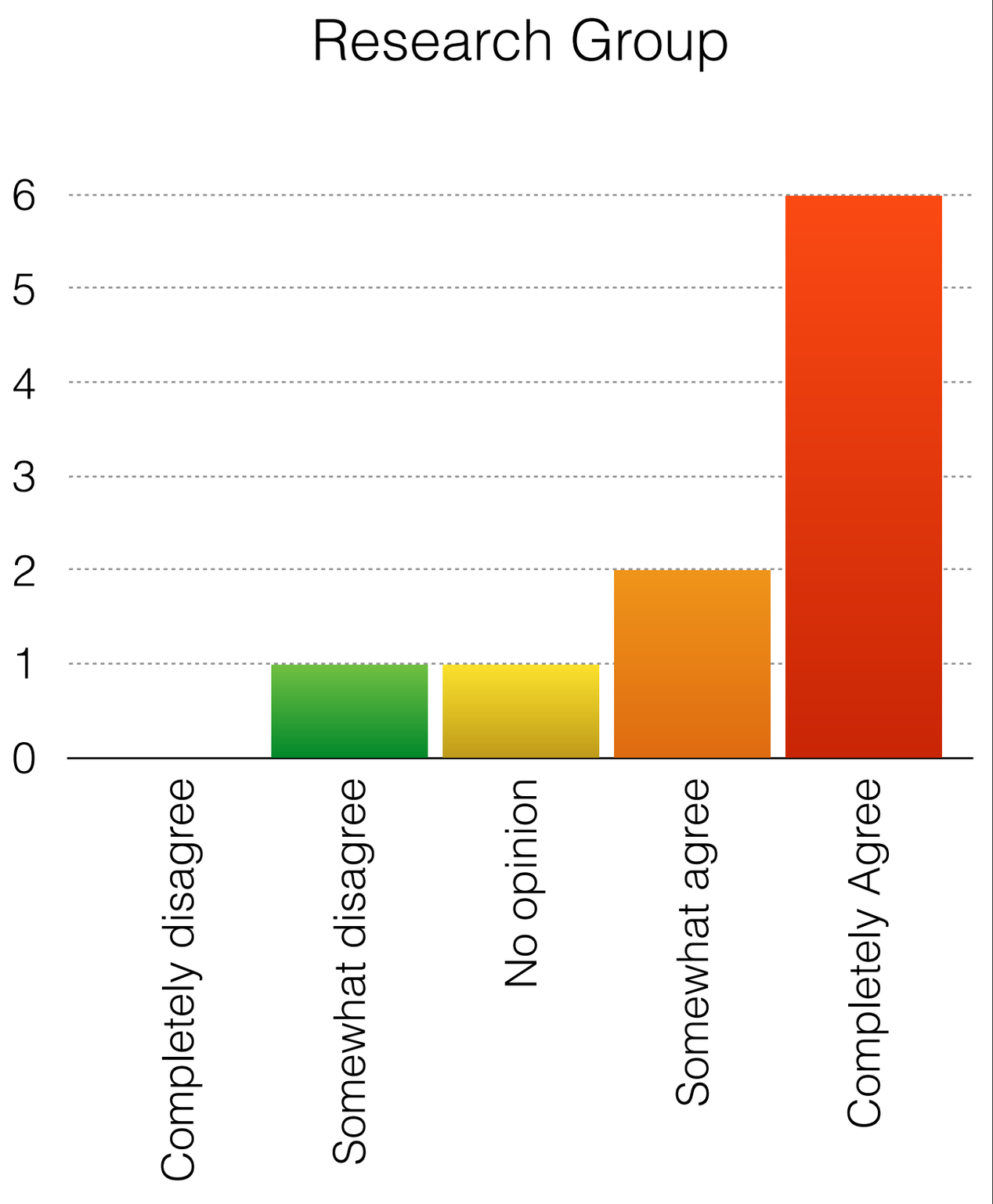
- Results: t = -3.047, df = 15.956, p-value = 0.007706





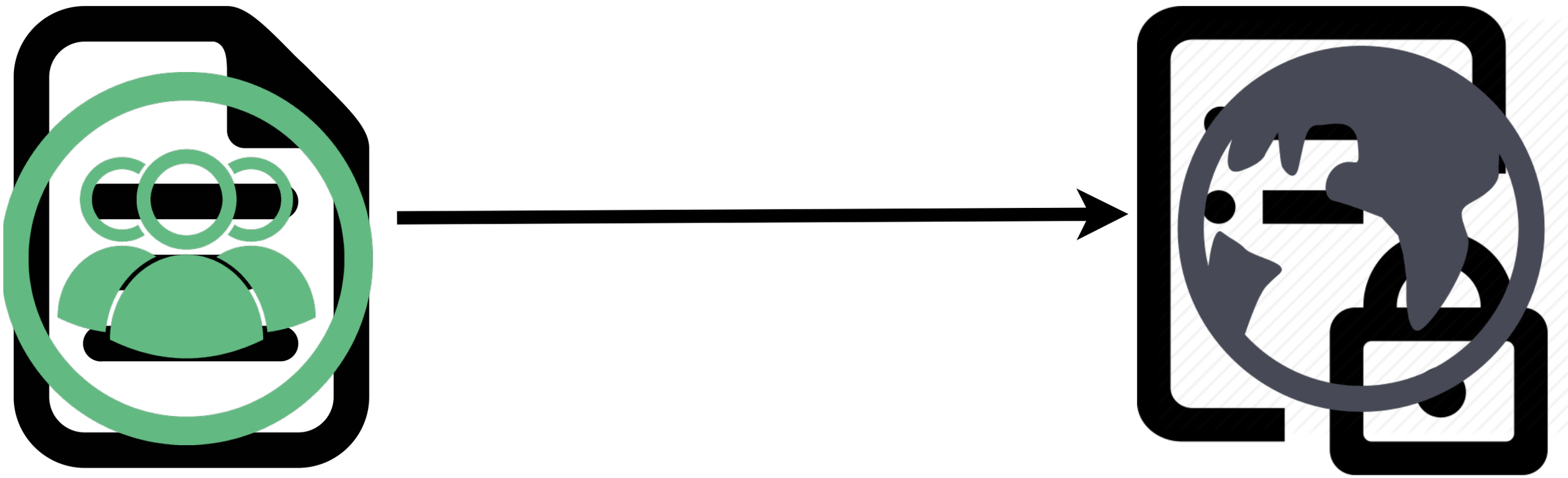
Will people share annotations?





Results Three: Researcher are comfortable share notes within the **research group**

- Results: t = 1.5302, df = 17.442, p-value = 0.1439



Comparison with existing work

Parameter	Notabean	Nurture.ai	Research Exchange
Open Domain / Access	✗	✗	✓
Fine-grained Annotation Types	✗	✗	✓
Textual Highlight Annotations	✗	✓	✓
Segregation of Document / Section Views	✗	✓	✓

Comparison with existing work

Parameter	Notabean	Nurture.ai	Research Exchange
PDF markup	✓	✓	✗
External Integration	✗	✓	✗
Dialogue Discussions	✓	✓	✗
Is the website fast + working? :)	✓	✗	✓

Next steps

- **Data Pipelines** - large scale deployment in communities using ParsCit Structured XML

- **Other Features** - like private annotations, use Linux model of user, group, public to change visibility of comments

- **Open Peer Review** - Positive feedback from OpenReview research engineer, discussion later today with team!

Summary

- Reading research papers is hard, especially for newcomers. We built ResearchExchange!
- Collaborative in-line annotations good solution in some settings (groups, peer-review)
- harder to convince people to add public annotations
- Exciting next steps - large scale deployment, OpenReview